1. (Currently Amended) An apparatus for preparing a specimen for microscopy, comprising:

a plasma generator for plasma cleaning said specimen;

means for removing material from said specimen;

means for coating said specimen with a conductive material; and

means for plasma etching said specimen which includes the selective spatial isolation of said means for plasma etching said specimen and said specimen from said plasma generator, said means for removing material and said means for coating said specimen when said means for plasma etching said specimen is operational;

wherein said plasma cleaning of said specimen and said coating of said specimen may be performed in a single process chamber under continuous vacuum conditions.

2. (Cancelled)

3. (Previously Presented) An apparatus according to claim 1, wherein said means for removing comprises means for etching said specimen using an ion beam.

4. (Original) An apparatus according to claim 3, wherein said means for etching comprises an ion source for directing said ion beam at said specimen.

5. (Original) An apparatus according to claim 4, wherein said means for etching further comprises a source of process gas positioned adjacent said ion source.

6. (Original) An apparatus according to claim 1, said means for coating comprising a magnetron sputtering device.

7. (Original) An apparatus according to claim 1, said means for coating comprising an ion source for directing an ion beam at a target, said target being formed of said conductive material.

8. (Cancelled)

9. (Cancelled)

10. (Cancelled)

11. (Cancelled)

12. (Cancelled)

13. (Cancelled)

14. (Cancelled)

15. (Cancelled)

16. (Original) An apparatus according to claim 1, wherein said plasma generator comprises a plasma tube, a coil wrapped around said plasma tube, and an RF power supply connected to said coil.

17. (Original) An apparatus according to claim 16, further comprising a source of process gas including oxygen connected to said plasma tube, said plasma cleaning being

performed using said process gas.

18. (Original) An apparatus according to claim 17, said process gas further including argon.

19. (Original) An apparatus according to claim 18, said process gas comprising a mixture of 75% argon and 25% oxygen.

20. (Original) An apparatus according to claim 17, said process gas further including a non-reactive gas.

21. (Previously Presented) An apparatus according to claim 1, further comprising a vacuum pump connected to said process chamber for evacuating said process chamber to a selected vacuum level.

22. (Cancelled)

23. (Cancelled)

24. (Previously Presented) An apparatus according to claim 21, further comprising an oil-free vacuum pump for controlling said vacuum conditions.

25. (Previously Presented) An apparatus according to claim 24, said oil-free vacuum pump selected from the group consisting of oil-free diaphragm pumps, molecular drag pumps,

turbomolecular drag pumps, molecular drag pumps backed by a diaphragm pump, turbomolecular drag pumps backed by a diaphragm pump, cryosorption pumps, reciprocating piston pumps, scroll pumps, screw pumps, claw pumps, non-oil sealed single and multistage piston pumps, and rotary lobe pumps.

26. (Previously Presented) An apparatus according to claim 1, further comprising a specimen stage for holding said specimen, said specimen stage being adapted to tilt said specimen with respect to said means for removing, said specimen stage being rotatable about an axis of rotation generally perpendicular to a plane defined by a surface of said specimen when said specimen is held by said specimen stage.

27. (Original) An apparatus according to claim 26, further comprising means for cooling said specimen stage.

28. (Original) An apparatus according to claim 26, said specimen stage being selectively moveable along said axis of rotation.

29. (Previously Presented) An apparatus according to claim 1, said chamber further comprising a specimen stage for holding said specimen, said specimen stage being adapted to tilt said specimen with respect to said means for removing, said specimen stage being rotatable about an axis of rotation generally perpendicular to a plane defined by a surface of said specimen when said specimen is held by said specimen stage.

30. (Previously Presented) An apparatus according to claim 1, said chamber further comprising a cold trap.

31. (Previously Presented) An apparatus according to claim 1, said chamber further comprising a crystal oscillator for measuring an amount of said conductive material that is deposited on said specimen.

32. (Cancelled)

33. (Cancelled)

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56. (Cancelled)

57. (Cancelled)

58. (Previously Presented) An apparatus according to claim 1, said plasma etching further comprising capacitive discharge plasma etching.

59. (Previously Presented) An apparatus according to claim 58, said means for plasma etching comprising a first electrode supported by said process chamber and a second electrode supported by said process chamber, said first and second electrodes defining a gap therebetween for receiving said specimen.

60. (Original) An apparatus according to claim 59, said first and second electrodes each comprising a substantially planar electrode, said first electrode and said second electrode being substantially parallel to one another.

61. (Previously Presented) An apparatus according to claim 60, further comprising a specimen stage for holding said specimen, said specimen stage being supported by said process chamber, at least a portion of said specimen stage being said first electrode.

62. (Original) An apparatus according to claim 61, said specimen stage being moveable in a direction substantially perpendicular to a planar surface of said first electrode.

63. (Original) An apparatus according to claim 61, said second electrode being moveable in a direction substantially perpendicular to a planar surface of said second electrode.

64. (Original) An apparatus according to claim 59, further comprising an alternating voltage source connected to said first and second electrodes for generating an electric field within said gap, said electric field generating a plasma from a gas introduced into said gap.

65. (Previously Presented) An apparatus according to claim 1, said plasma etching further comprising inductively coupled plasma etching.

66. (Cancelled)

67. (Cancelled)

68. (Previously Presented) An apparatus according to claim 3, further comprising means for ion beam etching said specimen, wherein said ion beam etching may be performed

under said continuous vacuum conditions.

69. (Previously Presented) An apparatus according to claim 68, further comprising an ion source for directing an ion beam at said specimen, said ion beam etching said specimen, wherein said etching of said specimen with said ion beam may be performed under continuous vacuum conditions.

70. (Cancelled)

71. (Cancelled)

72. (Cancelled)

73. (Previously Presented) An apparatus according to claim 69, wherein said ion source may selectively direct said ion beam at said specimen for ion beam etching said specimen under said continuous vacuum conditions.

74. (Original) An apparatus according to claim 73, further comprising a specimen stage for holding said specimen, said specimen stage being moveable between a first position in which said specimen is within a path of said ion beam such that said ion beam is directed at and impinges upon said specimen and a second position in which said specimen is outside of said path such that said ion beam is directed at and impinges upon said target.

75. (Previously Presented) An apparatus according to claim 74, said specimen stage being adapted to tilt said specimen with respect to said ion source, said specimen stage being

rotatable about an axis of rotation generally perpendicular to a plane defined by a surface at said specimen when said specimen is held by said specimen stage.

76. (Cancelled)

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116. (Cancelled)

117. (Cancelled)

118. (Previously Presented) An apparatus according to claim 1, further comprising a load lock chamber connected to said process chamber.

119. (Cancelled)

120. (Previously Presented) An apparatus according to claim 68, said etching comprising reactive ion beam etching, said apparatus further comprising a source of reactive process gas connected to said ion source.

121. (Previously Presented) An apparatus according to claim 58, said plasma etching utilizing a plasma generated by capacitive discharge, said plasma etching assembly further comprising an electrode and an alternating voltage source connected to said electrode.

122. (Cancelled)

123. (Cancelled)

124. (Previously Presented) An apparatus according to claim 59, wherein one or more of a size of said gap and a power of said alternating voltage source are automatically controlled based on parameters set by a user.

125. (Previously Presented) An apparatus according to claim 124, said plasma etching assembly further comprising two or more gas inlets, said process gas comprising a mixture of two or more process gasses selected by a user.

126. (Original) An apparatus according to claim 125, wherein said process gasses further comprise at least one of O_2, CF_4 and CHF_3.

127. (Previously Presented) An apparatus according to claim 1, said means for plasma etching further comprising two or more gas inlets, said plasma etching of said specimen utilizing a plasma generated from a mixture of two or more process gasses selected by a user.

128. (Previously Presented) An apparatus according to claim 1, said means for plasma etching being usable to plasma clean said specimen by generating a plasma from a process gas including oxygen.

129. (Previously Presented) An apparatus according to claim 1, wherein coating comprises ion beam sputter coating, said means for coating comprising a target formed of said conductive material, said ion source directing said ion beam at said target.

130. (Original) An apparatus according to claim 129, said means for coating further comprising a lever supported by said vacuum chamber, said lever holding said target, said lever being selectively moveable into a position in which said ion beam is directed at said target.

131. (Previously Presented) An apparatus according to claim 1, said means for coating comprising a plurality of targets, each of said targets being formed of a conductive material, said

ion source directing said ion beam at a selected one of said targets.

132. (Original) An apparatus according to claim 131, said means for coating further comprising means for moving said selected one of said targets from a covered position to an exposed position.

133. (Original) An apparatus according to claim 131, said means for coating further comprising a lever supported by said vacuum chamber, said lever holding said plurality of targets, said lever being selectively moveable into a position in which said ion beam is directed at said selected one of said targets.

134. (Original) An apparatus according to claim 133, said plurality of targets being held by a target holder, said target holder being moveable among a plurality of positions, each of said positions exposing one of said targets and covering a remaining one or more of said targets.

135. (Original) An apparatus according to claim 134, said target holder being rotatably supported by said lever, said target holder being rotatable among said plurality of positions.

136. (Original) An apparatus according to claim 135, said target holder further comprising a plurality of pins, said vacuum chamber supporting an arm, said target holder being selectively rotated by contact between said arm and any one of said pins.

137. (Original) An apparatus according to claim 133, further comprising means for selectively exposing said selected one of said targets and covering a remaining one or more of said targets.

138. (Cancelled)

139. (Previously Presented) An apparatus according to claim 1, further comprising a sample stage being moveable to a plurality of processing positions inside said vacuum chamber under said continuous vacuum conditions for performing said removing, said plasma cleaning, said plasma etching and said coating of said specimen.

140. (Original) An apparatus according to claim 139, said sample stage being automatically moveable among said processing positions based on parameters set by a user.

141. (Original) An apparatus according to claim 140, said parameters including an order of movement among selected ones of said processing positions.

142. (Original) An apparatus according to claim 139, said sample stage being moveable in a first direction along a vertical axis of said vacuum chamber, said apparatus further comprising means for detecting a first position of a surface of said specimen along said vertical axis, wherein said sample stage is moved automatically to said plurality of processing positions based on said first position.

143. (Original) An apparatus according to claim 142, wherein said first position is measured relative to a second position along said vertical axis.

144. (Previously Presented) An apparatus according to claim 139, said sample stage being moveable in a first direction along a vertical axis of said vacuum chamber, said apparatus further comprising a beam generating device and a beam sensor supported by said vacuum chamber, said beam generating device and said beam sensor being used to detect a first position of a surface of said specimen along said vertical axis, wherein said sample stage is moved automatically to said plurality of processing positions based on said first position.

145. (Original) An apparatus according to claim 144, wherein said first position is measured relative to a second portion along said vertical axis.

146. (Original) An apparatus according to claim 144, said beam generating device comprising a laser.

147. (Previously Presented) An apparatus according to claim 139, said sample stage being moveable in a first direction along a vertical axis of said vacuum chamber, at least a first portion of said sample stage that supports said specimen being rotatable about said vertical axis, and at least a second portion of said sample stage connected to said first portion being moveable in a first angular direction with respect to said vertical axis.

148. (Original) An apparatus according to claim 147, at least a third portion of said sample stage connected to said second portion being moveable in a second angular direction with respect to said vertical axis.

149. (Previously Presented) An apparatus according to claim 139, said sample stage having at least three degrees of selective independent movement.

150. (Original) An apparatus according to claim 149, sample stage having at least four degrees of selective independent movement.

151. (Previously Presented) An apparatus according to claim 1, said process chamber having a first aperture adjacent said plasma generator, a first moveable shutter for selectively covering said first aperture, a second aperture adjacent said means for plasma etching, and a second moveable shutter for selectively covering said second aperture.

152. (Withdrawn) A method for preparing a specimen for microscopy, comprising:

determining a first position of a surface of said specimen along an axis of a processing chamber;

automatically moving said specimen to one or more processing locations within said processing chamber based on said first position.

153. (Withdrawn) A method according to claim 152, said determining step further comprising determining said first position relative to a second position along said axis.

154. (Withdrawn) A method according to claim 152, said determining step further comprising:

generating a beam;

directing said beam at a sensor;

moving said specimen along said axis;

establishing said first position when a predetermined level is measured by said sensor.

155. (Withdrawn) A method according to claim 154, said beam comprising a laser beam.

156. (Withdrawn) A method according to claim 154, said predetermined level comprising approximately 50% of a level measured when said sensor is completely unobscured.

157. (Withdrawn) A method according to claim 156, said determining step further comprising:

(a) moving said specimen along said axis to an obscuring position in which said sensor is completely obscured and setting a blocked position variable equal to said obscuring position;

(b) moving said specimen along said axis to an unobscuring position

in which said sensor is completely unobscured, obtaining an unobscured sensor level reading, and setting a clear position variable equal to said unobscuring position;

(c) moving said specimen to a midpoint position that is approximately halfway between a position equal to said blocked position variable and a position equal to said clear position variable;

(d) obtaining a current sensor level reading at said midpoint position;

(e) determining whether said current sensor level reading is equal to approximately 50% of said unobscured sensor level reading;

(f) setting said first position equal to said midpoint position if said current sensor level reading is equal to approximately 50% of said unobscured sensor level reading;

(g) setting said blocked position variable equal to said midpoint position if said current sensor level reading is less than approximately 50% of said unobscured sensor level reading and repeating steps (c) through (h) until said first position is set in step (f); and

(h) setting said clear position variable equal to said midpoint position if said current sensor level reading is greater than approximately 50% of said unobscured sensor level reading and repeating steps (c) through (h) until said first position is set in step (f).

158. (Previously Presented) An apparatus for preparing a specimen for microscopy, comprising:

a processing chamber;

a sample stage, said sample stage being moveable to one or more

processing positions inside said processing chamber, said processing position being defined by three dimensional coordinates; and

means for detecting a first position of a surface of said specimen within said processing chamber;

wherein said sample stage is moved automatically to said one or more processing positions remote from said first position in any of three dimensions and at an angle relative to a beam impinging thereon.

159. (Original) An apparatus according to claim 158, wherein said first position is measured relative to a second position along said axis.

160. (Original) An apparatus according to claim 158, said processing positions including positions for performing one or more of etching said specimen, plasma cleaning said specimen, plasma etching said specimen and coating said specimen with a conductive material.

161. (Previously Presented) An apparatus for preparing a specimen for microscopy, comprising:

a processing chamber;

a sample stage, said sample stage being moveable to one or more processing positions inside said processing chamber, said processing positions being defined by three dimensional coordinates; and

a beam generating device and a beam sensor supported by said processing chamber, said beam generating device and said beam sensor being used to detect a first position

of a surface of said specimen within said processing chamber;

wherein said sample stage is moved automatically to said one or more processing positions remote from said first position in any of three dimensions and at an angle relative to said beam generating device.

162. (Original) An apparatus according to claim 161, wherein said first position is measured relative to a second position along said axis.

163. (Original) An apparatus according to claim 161, said processing positions including positions for performing one or more of etching said specimen, plasma cleaning said specimen, plasma etching said specimen and coating said specimen with a conductive material.

164. (Original) An apparatus according to claim 161, said beam generating device comprising a laser.